

**CITY OF FORT SMITH SUPPLEMENTAL SPECIFICATION
THERMOPLASTIC PAVEMENT MARKING**

The following new specification section is hereby added to the Standard Specifications for Public Works Construction, October 2018 Edition:

**SECTION 841
THERMOPLASTIC PAVEMENT MARKING**

841.01 DESCRIPTION

This item shall consist of furnishing and placing thermoplastic pavement markings, including words, arrows, and emblems, of the color and type specified, and the removal of pavement markings, all according to these specifications and in conformity with the dimensions and at the locations shown on the plans or as directed.

The markings are to be placed under existing traffic conditions. The work shall comply with the MUTCD except as modified by these specifications.

841.02 MATERIALS

The material used shall be a product especially compounded for traffic markings and be listed on the ArDOT Qualified Products List. Each container shall be clearly and adequately marked to indicated color, weight, batch or lot number, and type of material.

The material shall meet the requirements of AASHTO M 249 with the following exceptions on yellow materials:

Color Specifications							
Color Specification Limits – Daytime Initial							
Chromaticity Coordinates							
1		2		3		4	
x	y	x	y	x	y	x	y
0.499	0.466	0.545	0.455	0.518	0.432	0.485	0.454
Luminance Factor, Y(%)							
Minimum				Maximum			
40.0				60.0			

Initial daytime color determination will be made in accordance with AASHTO T 250. Values shall be evaluated on material without the drop-on beads.

Color Specification Limits – Daytime Retained							
Chromaticity Coordinates							
1		2		3		4	
x	y	x	y	x	y	x	y
0.560	0.440	0.490	0.510	0.420	0.440	0.460	0.400

Retained daytime color limits shall conform to the specifications for a minimum of ninety days for construction pavement markings and one year for all other markings. Retained readings will be determined on a beaded surface in accordance with the requirements of ASTM E 2366.

Color Specification Limits – Nighttime Initial with drop-on beads							
Chromaticity Coordinates							
1		2		3		4	
x	y	x	y	x	y	x	y
0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

Initial nighttime color limits will be determined in accordance with the requirements of ASTM E 2367 on a beaded surface.

The pigments used for the pavement marking material compound shall not contain any compounds that will exceed the values listed in the Environmental Protection Agency Code of Federal Regulations (CFR) 40, Section 261.24, Table 1.

The material shall not break down or deteriorate if held at the plastic temperature for a period of four hours nor by reason of four re-heatings to the plastic temperature. The temperature-viscosity characteristics of the thermoplastic material shall remain consistent and there shall be no obvious change in the color of the material.

The material shall not deteriorate by contact with sodium chloride, calcium chloride, or other chemical formations on the roadway or streets, or because of the oil contact on pavement material, or from oil droppings from traffic.

After application and proper drying time, material shall show no appreciable deformation nor discoloration under local traffic conditions and in air or road temperatures ranging from 0° F to 160° F. The material shall not smear or spread under normal traffic conditions at temperatures below 160° F.

Under this specification, the term “drying time” shall be defined as the minimum elapsed time after application when the pavement marking shall have and retain the characteristics required in the preceding paragraphs. In addition, the drying time shall be established by the minimum elapsed time after application when traffic will leave no impression or imprint on the applied marking. The drying time shall not exceed a characteristic straight-line curve, the limits of

which are two minutes at 50° F and 15 minutes at 90° F, measured at a maximum relative humidity of 70%.

The pavement marking material shall maintain its original dimension and placement. The exposed surface shall be free of tack. Cold ductility of the material shall be such as to permit normal movement with the road surface without chipping or cracking. The material shall not be slippery when wet and it shall not lift from the pavement in freezing weather.

The marking shall have a uniform cross section. The density and character of the material shall be uniform throughout its thickness and shall be completely reflectorized both internally and externally.

The glass beads used for the drop-on application shall meet AASHTO M 247 with a Type I gradation and shall be suitably treated to resist moisture and retain free flow properties. Beads shall not be specially treated to enhance flotation.

841.03 CONSTRUCTION REQUIREMENTS

The thermoplastic compound shall be screed or ribbon extruded to the pavement surface. The equipment used to apply the thermoplastic compound onto the pavement shall be suitably equipped for heating and controlling the flow of material. The equipment shall be constructed to provide continuous mixing and agitation of the material. The conveying parts of the equipment, between the main material reservoir and applicator, shall be so constructed as to prevent accumulating and clogging. The equipment shall be constructed so that all mixing and conveying parts, up to and including the applicator, maintain the material at the plastic temperature. The thermoplastic material shall be dispensed at a temperature recommended by the manufacturer. The applicator shall include a cutoff device remotely controlled to provide clean, square stripe ends and to provide a method for applying skip lines.

The thermoplastic reservoir shall be insulated and equipped with an automatic thermostatic control to maintain the proper temperature of the material.

The thermoplastic machine shall comply with the requirements of the National Board of Fire Underwriters.

Beads applied to the surface of the completed stripe shall be applied by an automatic bead dispenser attached to the pavement marking equipment in such a manner that the beads are immediately dispensed upon the completed line. The bead dispenser shall be equipped with an automatic cutoff control, synchronized with the cutoff of the pavement marking equipment. The beads shall be automatically applied at a minimum uniform rate of eight pounds of glass beads to every 100 square feet of surface.

Thermoplastic markings shall not be applied to the pavement surface when the pavement surface temperature is less than 50° F or when the pavement surface shows evidence of moisture.

On new concrete pavements where no pavement markings exist or on existing concrete or asphalt pavements where the existing pavement markings are paint or thermoplastic and do not conflict with the proposed markings, blasting with water or sand or a combination thereof will be required to remove any curing compound, oxidized paint or thermoplastic, or dirt to ensure a good bond. This blasting is considered surface preparation. On newly constructed asphalt pavements any sand, grit, or other surface contaminants must be removed using compressed air and/or sweeping. Water blasting may be necessary to remove surface contaminants which cannot be removed by the use of compressed air and/or sweeping. This work is considered surface preparation.

Conflicting pavement markings that exist shall be removed by blasting with water and/or sand or by grinding. This blasting or grinding is considered pavement marking removal and shall be measured and paid for as specified in Section 845.

The thickness of thermoplastic markings above the roadway surface shall be 90 mils (a minimum of 1,584 pounds per mile of 4" line). The thickness will be measured by a device supplied by the Contractor during the course of the project capable of measuring the thickness of the marking as installed on the pavement. The minimum thickness, as required above, will be measured in the center of the line when gauged by the equipment described above. The minimum thickness 1/2" from the edges shall not be less than 75% of the thickness required in the center. Maximum thickness of markings is 3/16".

On concrete pavements, except where thermoplastic markings are to be applied over existing thermoplastic markings, primer shall be applied prior to the thermoplastic markings. The primer shall be recommended by the thermoplastic manufacturer and shall be applied in accordance with the manufacturer's recommendations. The time between application of the primer and application of the thermoplastic markings shall also be in accordance with the manufacturer's recommendations.

Spotting the pavement for centerline location on two-way roadways is required. It will be the responsibility of the Contractor to spot using a string line or chain so that spots are placed at intervals not exceeding 10'. The Engineer will establish the no passing zones if required. On one-way roadways spotting is required for the initial edge line or lane line placed. Edge lines and/or lane lines may be installed by referencing to center or lane lines. Edge lines shall not be broken for driveways. The trace of the thermoplastic line shall be uniform.

The finished lines shall have well defined edges, shall be uniform in thickness, and shall be straight and true. No stripe shall be less than the specified width. Any corrections or variations in width or alignment of the stripes shall not be made abruptly. Lines that cannot be corrected to

meet these requirements shall be removed in accordance with Section 845 at the Contractor's expense.

Line removal as specified on the plans shall be performed in such a manner that no conflicting pavement marking will be left in place. Removal of the pavement marking by a means that will gouge the surface will not be permitted.

The Contractor shall only use workers experienced in installing thermoplastic markings.

841.04 MEASUREMENT AND PAYMENT

- A. **THERMOPLASTIC PAVEMENT MARKINGS.** Thermoplastic Pavement Markings shall be measured by the linear foot of material actually placed for the specified color and width of stripe. Work completed and accepted under the item of Thermoplastic Pavement Markings will be paid for at the contract price bid per linear foot in place, which price shall be full compensation for furnishing and installing markings; for surface preparation; for furnishing and installing primer (where required); and for all labor, tools, equipment, furnishing thickness gauge, and incidentals necessary to complete the work.
- B. **THERMOPLASTIC PAVEMENT MARKINGS (WORDS, ARROWS, & EMBLEMS).** Words, Arrows, Railroad Emblems, and Bicycle Sharrows will be measured by the unit. Thermoplastic Pavement Marking (Words), (Arrows), (Railroad Emblems), and (Sharrows) will be paid for at the contract price bid per each in place, which price shall be full compensation for furnishing and installing Words, Arrows, Railroad Emblems, and Bicycle Sharrows; for surface preparation; for furnishing and installing primer (where required); and for all labor, tools, equipment, furnishing thickness gauge, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Thermoplastic Pavement Marking White (____")	LF
Thermoplastic Pavement Marking Yellow (____")	LF
Thermoplastic Pavement Marking (Words)	EA
Thermoplastic Pavement Marking (Arrows)	EA
Thermoplastic Pavement Marking (Railroad Emblems)	EA
Thermoplastic Pavement Marking (Sharrows)	EA